Failure Inspection Post Reliability Stress

Looking for issues that are present that does not cause failure? How far from the cliff is the part?

As part of the flow during reliability testing of devices, it is critical to perform a failure inspection under magnification to ensure that no devices have damage such as delaminations, voids, cracks and material density changes. Performing inspection pre-stress and post-stress will help identify issues that result in failure as well as those that don’t so you can characterize how close to failure your devices are.

- Die attach voiding and small delamination
- Minor cracking of the solder bumps
- Delamination of the metal layers in the substrate (like is shown on the via image)
- Voiding in the underfill or encapsulant
- Corrosion
- Change in the material appearance of the encapsulant, underfill, substrate
- Thickness of the intermetallic layers
- Just to name a few of the possible issues
- Or are your parts passing so well that some cost cutting materials consideration might be in order?

**FLIP CHIP - AS RECEIVED: OPTICAL, X-RAY, C-SAM AND CROSS SECTION**

<table>
<thead>
<tr>
<th>Top</th>
<th>Bottom</th>
<th>Heat spreader removed</th>
<th>Thermal grease removed</th>
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**POST HAST**

<table>
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Typically looking for corrosion, discoloration of the substrate, cracking or chip outs on the die.
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FLIP CHIP - AS RECEIVED: X-RAY

Small voids observed, they do not increase after HAST

POST HAST

Typically looking for void growth in the solder bumps/balls, or deformation.

FLIP CHIP - AS RECEIVED: C-SAM

POST HAST, NO DEGRADATION OBSERVED AFTER HAST

Typically looking for small delamination areas, heat spreader glue adhesion gaps and thermal grease attach area.
Typically looking for small cracking of the solder, intermetallic thickness, voiding/delamination in the weave or along the vias.

Side of vias in substrate have some pull away spots

A few more voids in the solder balls are observed on the post HAST than the fresh unit - this is unlikely to be a result of the HAST but does provide a larger number of solder balls/bumps to be viewed.